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Agricultural Sciences

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1983 Accomplishments for Research, Extension, and Higher Education

A Report to the Secretary of Agriculture



The Joint Council on Food and Agricultural Sciences was established in 1977 to encourage and coordinate research, extension, and higher education activities in the food and agricultural sciences. This role was strengthened in the Agriculture and Food Act of 1981, which directed the Department to improve the planning and coordination of research, extension, and higher education within the public and private sectors and to relate the federal budget process to the overall functioning of the system.

The Joint Council identified four reports which will work towards improving the overall effectiveness of the food and agricultural system.

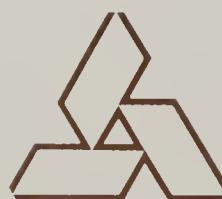
A long-term **needs assessment** (20-30 years) for food, fiber, and forest products, including a discussion of the research, extension, and higher education requirements for meeting the identified needs. (This task was assigned to the Secretary of Agriculture in the Agriculture and Food Act of 1981. He requested the Joint Council to fulfill this responsibility). The needs assessment report was prepared and published in two separate documents. One is the *Reference Document: Needs Assessment for the Food and Agricultural Sciences* and the other is the *Summary: Needs Assessment for the Food and Agricultural Sciences*.

A **five-year plan** to reflect the coordinated goals and objectives of the research, extension, and higher education community. This report will be completed in February 1984, followed by biannual updates.

An **annual priorities report** on research, extension, and higher education, which presents the Joint Council's priorities for the next fiscal year, the required financial support, and suggested federal, state, and private-sector roles. This report will be completed by June 30 of each year.

An **annual accomplishment report** which specifies the ongoing research, extension and higher education programs and respective accomplishments, along with expectations for the future. This report will be completed by November 30 of each year.

These four reports are inter-related although each is published separately. They constitute an overall strategic planning process which will eventually provide the food and agricultural science system with a means of assessing short-term and long-term future needs and reflecting on past accomplishments. It also will provide a foundation for planning the most effective and efficient means for meeting the future demands for food, fiber, and forest products. These four reports offer a continuing mechanism by which the research, extension, and higher education programs can assess future needs.



The symbol appearing on the front cover represents the purpose of the Joint Council (i.e., to improve planning and coordination among research, extension, and higher education) and the cooperative character of the food and agricultural science system within federal, state, and private organizations.

JOINT COUNCIL ON FOOD AND AGRICULTURAL SCIENCES

Secretariat:
Rm. 321A, Admin. Bldg.
U.S. Department of Agriculture
Washington, D.C. 20250

December 30, 1983

Honorable John R. Block
Secretary of Agriculture
Washington, D.C. 20250

Dear Mr. Secretary:

The Joint Council on Food and Agricultural Sciences is required by Section 1407, Public Law 97-113, as amended by Public Law 97-98, to submit to the Secretary of Agriculture a summary specifying ongoing research, extension, and teaching programs, accomplishments of those programs, and future expectations.

The U.S. food and agriculture sector contributes significantly to the national economy and to the promotion of the health and welfare of people. These achievements are possible largely because of the sector's scientific, technological, and educational base that provides and transfers the expertise necessary to meet domestic and export demands.

On behalf of the Joint Council, we are pleased to submit the 1983 Accomplishments Report. The enclosed report summarizes selected examples of research, extension, and teaching accomplishments and examples of progress of the Joint Council in bringing about more effective research, extension, and teaching by improved planning and coordination. State and Federal planning and coordination activities are also highlighted.

We look forward to discussing this report with you.

Sincerely,



ORVILLE G. BENTLEY
Cochairman



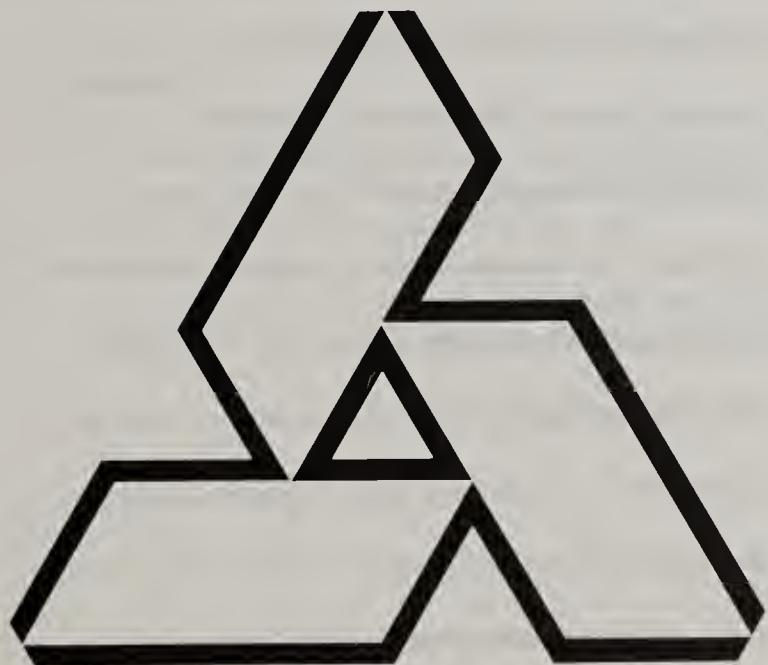
JAMES H. ANDERSON
Cochairman

Enclosure

The Joint Council fosters coordination and planning in public and private research, extension, and teaching in the food and agricultural sciences.

1983 Accomplishments for Research, Extension, and Higher Education

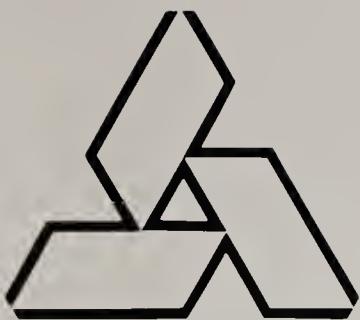
A Report to the
Secretary of Agriculture



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The Joint Council wishes to express its appreciation to Larry R. Miller, Executive Secretary to the Joint Council, for his assistance in preparing this report.



Executive Summary

The U.S. food and agricultural sector relies heavily on scientific and technological innovations for maintaining its high level of production efficiency and competitive position in world markets. Fortunately, in a free enterprise system, the food and fiber industries have access to the expertise developed in both the public and private sectors. Another strength of the system is the long history of viable linkages among the science and education institutions which provide expertise to support the food and fiber industries. The vitality of these industries is dependent upon a continuous flow of technical information and expertise. As changes occur, managers and producers require new information and expertise to make the necessary adjustments.

The 1983 Accomplishments in Research, Extension, and Higher Education Report developed by the Joint Council on Food and Agricultural Sciences highlights developments of the past year.

Research, Extension, and Teaching Accomplishments

The U.S. food and agricultural science and education system reported numerous significant advances in 1983. Research, extension, and teaching programs focused on:

- Conservation and efficient use of natural resources, which are vital to sustaining long-term productivity.
- Efficient production, processing, and marketing of food, fiber and forest products to allow the continuation of U.S. competitiveness in world markets while providing safe and wholesome food domestically at the lowest possible cost.
- Improvements in economic opportunities and the quality of rural life to assure that efficient contributions will occur within the food and agricultural sector.

Selected program accomplishments appear below:

Conservation and Natural Resources

- Lasers are now used to level the soil and conserve water during irrigation.
- A mathematical model was developed that evaluates productivity losses from soil erosion for the Nation's croplands and rangelands.
- A new inventory system, based on satellites, aerial photography plots, and a field plot system, is being used to estimate the natural resources in Alaska.
- More than 846,000 youths in America participated in 4-H natural resource programs involving forestry, wildlife and fisheries.

Production, Processing and Marketing

- A computer information network, now in operation, gives researchers quick access to over 400,000 plant germplasm samples for use in breeding for resistance to pests, diseases, and drought.
- Researchers have developed a technique to freeze and thaw live embryos of insects, opening the way to preserving rare genetic strains of insects, such as those used for biological control of insect pests.

-
- A new and sensitive technique is now available for measuring accurately the level of vitamin D in milk, blood, and tissues of animals and humans; it will improve the understanding of the role of vitamin D in metabolic diseases of animals and humans.
 - Educational programs related to direct and electronic marketing have improved farmers' competitiveness and market efficiency as buyers and sellers negotiate via computer terminals.
 - An enzyme has been discovered that degrades lignin, the natural cementing substance that stiffens wood fibers; new applications of technology now exist in wood processing and controlling wood decay.

Promotion of Health and Welfare of Rural People and Communities

- Nutrition education programs for unemployed and financially restricted families provide assistance in food purchasing, meal planning, food preservation, and projecting food prices.
- A National Rural Development Symposium involved associations of towns and townships, counties, development organizations, and the National Governors Association, all of whom interacted on issues facing rural governments.

Agricultural Policy

- An economic research analysis of the recent declines in U.S. farm exports showed that several factors influence exports; two factors, foreign indebtedness and exchange rates, were found to reduce U.S. farm exports.
- A national higher education agenda was published for developing the scientific, professional, and managerial expertise necessary to assure the Nation of an adequate scientific expertise base; the document serves as a vehicle to alert policymakers and decisionmakers and the general public of the actions which must be initiated by the public and private sectors of agriculture to assure this base.

Joint Council Activities

Development of a long-term needs assessment (20–30 years) for food, fiber, and forest products and the research, extension, and higher education requirements to meet the identified needs represent a major activity for the Joint Council in 1983. The Secretary of Agriculture will submit the Needs Assessment to Congress in January 1984.

The Council is also developing a 5-year plan that reflects the goals and objectives of the research, extension, and higher education community. State, Federal, and private performers contributed in the development of the Needs Assessment and the 5-Year Plan.

The Joint Council and its committees and partners in food and agricultural sciences identified and ranked priorities for research, extension, and higher education. Twenty-four national priorities were identified. Eight were selected and ranked by the Council and presented to the Secretary of Agriculture.

Additional topics given attention during 1983 were (a) issues and actions for the development of human expertise, (b) a focus on what constitutes the most appropriate parts of information flow

and exchange, (c) contributions of 1890 institutions and Tuskegee and their linkages with 1862 institutions, (d) contributions of non-land-grant institutions and their linkages with land-grant institutions, (e) a review and discussion of the relationships among the various ongoing studies in the food and agriculture system and their relationship with Council activities, and (f) role of the Secretary of Agriculture in planning and coordinating federally funded agricultural research and extension programs (joint meeting with the National Agricultural Research and Extension Users Advisory Board).

National/State Planning Activities

Within the food and agricultural system, numerous national and state studies and evaluations have been conducted and used to improve program effectiveness. In development of the studies, state, federal, and private performers of agricultural science and education programs were involved. Each of the studies, whether representing research, extension, or teaching, emphasized agriculture in the future, and the efficient use of human resources.

Figure 1.
The U.S. Food and Agricultural Science and Education System

Cooperative State Institutions:

- Land-grant colleges or universities in each state as authorized by Act of 1862, plus 16 colleges of 1890 and Tuskegee Institute, have programs of higher education in food and agricultural sciences.
- Fifty-eight State agricultural experiment stations (many with networks of substations) plus 16 schools of forestry, plus certain schools of home economics and veterinary medicine conduct research programs partially supported by Federal formula funds. Research investment (all sources) was \$1,058 million in FY 1982, involving 7,556 science years of research effort.
- Cooperative Extension Services exist in all 50 states plus the District of Columbia and U.S. territories. With total funding at approximately \$875 million last year, Cooperative Extension programs involved almost 17,000 professional staff years, plus nearly 5,500 paraprofessional staff years, plus significant inputs by 1.5 million volunteers.

Other Colleges and Universities:

- Approximately 65 non-land-grant, State-supported colleges or universities conduct programs of higher education, research and outreach in food and agricultural sciences.
- Other public and private institutions of higher learning range from major multidisciplinary universities to specialized vocational centers or institutes.

USDA Research/Education Agencies:

- The Agricultural Research Service with funding of \$460.2 million in FY1983 involves 2,800 science years of research at 147 locations in the United States and abroad; it also includes the Office of Higher Education with programs directed toward strengthening scientific and professional expertise.
- The Cooperative State Research Service channels most of its funds—\$245 million in FY—1983 to the cooperating State research system on formula basis; it also includes competitive and special research grants and Federal administration.
- The Extension Service, with funding of \$329 million in FY1983, channels most of its funds to the Cooperative Extension system; it also includes Federal administration.
- The National Agricultural Library, funded at \$9 million in 1983, provides wide-ranging library and technical information services.
- The Economic Research Service with funding of \$39 million for FY 1983, accounts for about 500 SY's of economic and social science research and analysis.
- The Forest Service (research divisions) with funding of \$105 million in FY 1983 provided nearly 900 SY's of research in resource management and utilization plus resource protection functions.
- Other USDA agencies have limited but direct R&E roles:

Office of International Cooperation and Development
The Soil Conservation Service
The Agricultural Marketing Service
Office of Transportation
The Agricultural Cooperative Service
The Statistical Reporting Service

Other Federal Agencies:

- At least 14 Federal Departments, Commissions, and independent agencies besides USDA either conduct research and education programs closely related to agriculture and forestry or provide funds to support programs in the USDA-State system. Total funding for such programs in FY1983 is estimated at approximately \$700 million.

Private Firms:

- Research and development (R&D) are performed by equipment, seed, fertilizer, and other input suppliers: producing, processing and distributing operations; and specialized private R&D firms. No hard data on total funding or specific personnel are available. (Recent estimates of food and agricultural research conducted by private firms were approximately \$2.5 billion, larger than the USDA-State research system funding.)
- Technical information dissemination similar to some functions of Extension is performed by field personnel or buyers of farm commodities, dealers of farm inputs, and trade journals or publications including the farm press and specialized technical information or consulting firms.

Other Private Organizations:

- Foundations or similar organizations facilitate or channel funds to research and/or education programs in the public sector. Funding from these sources is estimated at \$20 million annually.
- Associations formed by private firms conduct research and/or educational programs for their members.

Introduction

The U.S. food and agriculture sector contributes significantly to the national economy and to the promotion of the health and welfare of the people. These achievements continue largely because of the sector's superb scientific, technological, and educational base that provides the expertise necessary to meet both domestic and export demands. So that farmers, ranchers, forest producers, agribusiness personnel, and consumers can use new knowledge and technology, a teaching and extension network must link the science of agriculture with its producers and ultimate users.

Perhaps the greatest strengths of the food and agricultural science and education system (see figure 1 on facing page) are the decentralized authority, independent decisionmaking processes, and the formal and informal linkages that permit planning and coordination among the participants.

States, Federal agencies, and private entities operate differently to serve their clientele. Strong communication networks enable scientists to stay aware of the work of their peers. These same networks give administrators and managers information to make intelligent decisions.

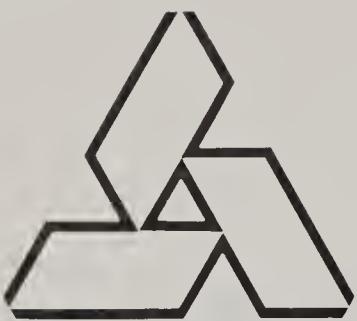
Financial support for this complex, decentralized system comes from several sources: State, Federal, local, private, and nonprofit organizations. Most funding is from State and Federal appropriations made, through entitlements, formula distributions, direct and competitive grants, and line-item budgets, to institutions in the State/Federal partnership.

This partnership has its legislative roots in the Land-Grant Act of 1862 (the First Morrill Act). This Act granted Federal land to every State that agreed to establish at least one college to teach agriculture and the "mechanical arts" as well as other scientific and classical subjects. The Second Morrill Act of 1890 added the black public colleges and institutions in 16 Southern and border States to the land-grant system.

The Hatch Act created the State agricultural experiment stations in 1887. In 1914, the Extension Service was established—to provide instruction and demonstrations in agriculture and home economics and related subjects. President Lincoln's charter to the Department of Agriculture in 1862 stressed practical studies, the first research and development effort in the U.S. Government.

These landmark pieces of legislation created the unique partnership among the U.S. Department of Agriculture, individual State and county governments, and land-grant colleges and experiment stations.

The Food and Agriculture Acts of 1977 and 1981 identified USDA as the lead agency for food and agricultural science and education and emphasized participation beyond USDA and the land-grant colleges. These acts recognized explicitly the need to coordinate better the work within this system among Federal agencies, between USDA and States, and with the private sector. The legislation also authorized participation of non-land-grant universities in the partnership. The Joint Council on Food and Agricultural Sciences was established and given the responsibility of bringing about more effective research, extension, and teaching by improving planning and coordination, building on the linkages already in existence.



Accomplishments of the Food and Agricultural Research, Extension, and Teaching Programs



The U.S. food and agricultural science and education system and its research, extension, and teaching programs are complex and diverse. As a result, accomplishments vary considerably in scope and impact. Selected examples appear below.

The accomplishments below include those that involve multiple programs and functions and the six broad categories of the common program structure: (1) Natural Resources, (2) Production and Protection, (3) Processing, Marketing, and Distribution, (4) People and Communities, (5) Agricultural Policy, and (6) General Administration and Program Support.

This year's accomplishments can be linked to the priorities identified in the Joint Council's report, "FY 1985 Priorities for Research, Extension, and Higher Education—A Report to the Secretary of Agriculture"¹ issued in June 1983. Specific emphases which were identified and ranked were: basic biotechnology research; scientific expertise development; communications technology; analysis of price and income policies; sustaining soil productivity; human nutrition, including food safety and quality; water management; and forest-, range- and pasture-land productivity.

The accomplishments also reflect the major thrusts that were addressed in the Joint Council's report, "Proposed Initiatives for the Food and Agricultural Sciences: 1981-86,"² issued in January 1981.

Accomplishments Involving Multiple Functions

Many program accomplishments at the State and Federal level involve the integration of research and education functions and the involvement of more than one organization/institution.

Range Management: Programs have been established at two ranches in Nevada to study and demonstrate range management practices. One, a cooperative effort between the University of Nevada and the USDA Agricultural Research Service (ARS), is conducted on the Gund Research and Demonstration Ranch owned by the University. The other was established on the Saval Ranch, a privately owned operation.

The Gund Ranch is a site for pilot testing the latest range improvement techniques as well as different methods for sagebrush control and reseeding. Resulting knowledge forms the basis of a long-term study on evaluating grazing management systems and their effects on water infiltration, runoff and erosion, weed control, response of nongame wildlife species during and after brush control, and reseeding.

Note: Footnotes refer to items in Appendix 3.

The Saval program, a cooperative effort involving the Saval Ranch, Bureau of Land Management, U.S. Forest Service, Soil Conservation Service, USDA-ARS, and the University of Nevada, will be a long-term study of intensive cattle grazing systems. This project offers the opportunity for basic and applied research in disciplines involving soil, vegetation, livestock, wildlife, fisheries, watershed hydrology, and economics. Cooperators will develop and validate models to integrate information and organize the disciplines into useful management systems for land managers.

Both programs provide bases for field days in which the Cooperative Extension Service can pass information on to producers and land managers and train Extension personnel. Students in range management at both the Universities of Nevada and California, as well as science students in high school, derive educational benefits at the Gund Ranch. The Saval Ranch will provide students with a real-life field laboratory for study of field management. The Saval Ranch will also provide employment for trained students as well as students in intern and volunteer programs.

Integrated Pest Management (IPM): The Western Region has a very strong IPM effort under the auspices of Regional Research Project W-161. The project focuses on six commodities—cotton, potatoes, alfalfa, small grains, range, and tree fruits. First Order Manuals underway for cotton, potatoes, and alfalfa detail the pest complexes affecting the commodities and compile the state-of-the-art technology useful in an IPM program. Each of the three manuals is based on existing publications of, or developed in cooperation with, the California State Agricultural Experiment Station. Expected publication dates are: cotton, January 1984; potatoes, late fall 1984; and alfalfa, early spring 1985.

As additional needs are identified, manuals for other pest complexes will be developed cooperatively by the institutions best qualified to contribute to them. Pest complexes slated for attention are those associated with barley yellow dwarf, alfalfa stand decline, early dying of potatoes, and the potato leaf roll virus.

Integrated Reproductive Management (IRM): Individual state agricultural experiment stations and Agricultural Research Service in the Western Region are implementing Integrated Reproductive Management (IRM) programs. Eight states are developing programs for beef cattle; four states, for dairy cattle; and six states, sheep. Three states have programs for each of the three species, two states include two species, and six states are developing programs for one species. Base data have been collected to determine the exact nature of the IRM program and develop cooperative arrangements with producers. Discussions continue on establishing three regional model IRM programs—one for each of the three major species of animals.

Biological Control of Weeds: Studies on the biological control of the musk thistle began in 1969. The plant, commonly called musk thistle, is not a single species but rather a complex of species within the genus *Carduus*. Prominent in this complex are the species *C. thoermeri*, the most numerous, and *C. nutans*. A weevil, *Rhinocyllus conicus*, introduced in Montana and subsequently in more than a dozen other states, has caused a massive reduction in seed production of *C. thoermeri* and *C. nutans*, reducing plant populations by 95 percent at some sites. Four other insects and one plant pathogen being studied show promise against plants that make up the musk thistle complex.

Biological control of the musk thistle, a problem in 26 states, is coming closer to reality. This effort involves several Agricultural Research Service laboratories in this country and Europe,

several State agricultural experiment stations, USDA Extension Service, and several State Cooperative Extension Services.

Soil Conservation: The high rate of soil erosion in the Palouse area of Washington, Oregon, and Idaho is a highly complex and costly problem which required organizing and mobilizing scientific resources. The model chosen to attack the problem was named STEEP (Solutions to Environmental and Economic Problems). Initiated six years ago with an expected life of 15 years, the model approaches the problem from five directions: tillage and plant management, plant design, erosion and runoff predictions, pest management, and socioeconomics of erosion control. The research projects cut across many scientific disciplines and state boundaries, and involve the work of 55 scientists funded by the three states, USDA-ARS, and private industry.

Results of STEEP thus far have shown that minimum tillage or no-tillage practices significantly reduce soil losses, and some of the causes of decreased yields under these practices have been identified. The ultimate success of the concept must be judged on whether or not soil erosion in the Palouse area is brought under control in the 5-10 years without unacceptable costs in yield. The Cooperative Extension Service schedules field days to explain results of the research to wheat producers and help assure that practices proven by research are carried to the producers.

Natural Resources

Research, extension, and teaching programs are conducted to develop and gain adoption of technology for using and conserving soil, water, and air resources while sustaining optimum agricultural productivity. Much of this activity involves developing management systems and strategies that optimize the production of food and fiber, minimize the adverse effects of agricultural systems on the environment, and assure the efficient use of our soil, water, and air resources for future generations.

Productivity Losses from Erosion Evaluated: A mathematical model jointly developed by Agricultural Research Service and Economic Research Service scientists, in cooperation with Soil Conservation Service specialists, is being used by SCS to evaluate productivity losses from soil erosion for the Nation's croplands and rangelands. The model, which contains components for simulating erosion, plant growth, crop yield, and farm economics, has been tested on about 200 U.S. sites. The model provides planners and decisionmakers—from the farm to the national level—a tool for selecting optimum resource management strategies.

In 1983, the Maryland Agricultural Experiment Station contributed development of a computer-based model to describe soil moisture and ground water dynamics in sloping fields. This enables prediction of water table levels and root-zone soil moisture as they are affected by precipitation and evaporation. Scientists can predict the movement of salts and other similar pollutants into the ground water. The University of Maryland's work is based on watershed scale rather than field scale simulations. Recent studies comparing the simulated water runoff events with data from storms found a close correlation.

Soil and Water Conservation: Extension programs in soil and water conservation reflect the priorities of the National Conservation Program. These programs vary widely in content and focus, as Extension responds to state and regional interpretation of the problems of soil erosion, water conservation and associated priorities. In the Northwest, programs focus on the use of conservation tillage to reduce soil erosion on the wheatlands of the Palouse and the Columbia Plateau; in the Southwest, the focus is on irrigation management, pumping plant efficiency, and

use of waters and other nonconventional sources of water for irrigation. In the South, Extension programs in conservation tillage emphasize conservation tillage to reduce erosion, to conserve moisture, and to improve productivity, and water conservation is receiving attention to stretch existing supplies for both agriculture and domestic uses. The North Central states have expanding programs of conservation tillage, irrigation management and groundwater protection; the Northeast is experiencing a resurgence of efforts to protect the quality of surface waters (e.g., the Chesapeake Bay) and groundwater from the impacts of urban and rural activities. The linkage between the water resources (both surface waters and groundwaters) and the management of the land resources (for agriculture and for development) is emerging as a major issue in many Extension programs.

Renewable Resources Extension Act (RREA): The funding of the Renewable Resources Extension Act with \$2 million in 1982 and 1983 serves as a catalyst for Extension programming for private nonindustrial forest and rangeland owners and managers. These programs are resulting in new and expanded efforts nationwide in training sessions, correspondence courses, seminars, demonstrations, and continuing education to assist owners and managers to reach their objectives, whether for timber, forage, wildlife, or recreation. Another result of RREA funding is increased activity in the formation of productivity and advisory committees that involve local timber industry, agency officials, and landowners in identifying natural resource needs and opportunities and developing Extension programs at the local level.

Irrigation Scheduling: An integrated water-energy management system was designed and installed by the Agricultural Research Service on a field in eastern Colorado. The intent was to develop technology for integrating advanced water management and peak electrical demand into a system to optimize irrigation while minimizing electrical demands during peak usage periods. The system combines the microcomputer with radiotelemetry to control irrigation and provide irrigation priorities for each field based on temperature, solar radiation, humidity, and wind.

Immediate benefits of the system have been 14 percent lower power costs (\$1,000 per year) and a saving of 3 hours of work and 60 miles of driving each day during the irrigation season. Concepts developed are included in advanced irrigation topics graduate course at Colorado State University.

Laser Leveling for Irrigation: Critical factors affecting the profitability and adoption of laser leveling technology were identified and evaluated in Arizona by USDA's Economic Research Service and the Arizona Agricultural Experiment Station. Laser leveling investments conserve water by improving irrigation application efficiencies and may also increase farm profits. In the step-by-step procedure, any water user could estimate the break-even water costs necessary for laser leveling to be profitable.

Economics of Conservation Tillage: An analysis of conservation tillage statistics by the Economic Research Service revealed that minimum tillage and no-till operations have increased dramatically from 1973 to 1981. Thirty-two percent of the cropland was managed under these conservation tillage methods in 1981. Minimum tillage and no-till operations can, respectively, reduce soil erosion by 25 and 99 percent compared with conventional tillage, while simultaneously reducing fuel and labor costs and increasing farm profits.

Reforestation and Timber Stand Improvement: Projections for timber supply and demand indicate that demand for softwood and hardwoods will exceed supplies through the year 2030

and beyond. In cooperation with other federal agencies, the timber industry, and states, Extension Service is increasing state and local programming in reforestation and timber stand improvements. In the Southern and Northeast regions of the country, country productivity committees work directly with landowners to conduct reforestation and timber stand improvements efforts with Extension and industry.

Collaborative Research Program: To capitalize on the varied climates, institutional capabilities, and scientific expertise available in other countries, USDA's Office of International Cooperation and Development organized a small program of mutually beneficial collaborative research projects in FY 1982 involving prominent U.S. and foreign agricultural research centers.

Certain agricultural ecosystems in Mexico from the traditional Aztec and Mayan civilizations are thought to be free of diseases caused by soil-borne pathogens. Rutgers University, Agricultural Research Service, and Mexican scientists are studying these traditional agricultural ecosystems, before they no longer exist, to understand how they prevent disease, and to isolate and identify soil microorganisms or other factors that may be responsible for disease control.

Researchers have found that Aztec and Mayan soils have higher organic matter content, moisture holding capacity, calcium content, and total microbial activity than modern agricultural soils.

Hardwood Resource on Nonindustrial Private Forest Lands in the Southeast Piedmont Region: Analysis of hardwood management in the South has received less attention from resource analysts and practicing foresters than pine management. Higher costs for converting and treating stands of hardwoods have sparked rethinking about hardwood management. This change has occurred mainly among nonindustrial private forest landowners.

Researchers at the Forest Service Southeastern Station analyzed plot information collected on over 28 million acres of hardwood lands of private nonindustrial forest landowners in the Piedmont Region from Virginia to Georgia. Analysis showed that hardwood stands in the Piedmont can be managed under inexpensive, nonintensive treatment regimes. Nonindustrial private landowners in the Piedmont can use the guidelines developed to minimize out-of-pocket treatment costs, increase incomes from timber harvest, and upgrade future stand conditions. The guidelines should prove valuable to State forestry agencies, Extension foresters and others who are concerned with forestry programs in the area.

Huge Resource Inventory Underway in Alaska: A new inventory system is being used in Alaska to survey the natural resources on 32 million acres of the Tanana River basin in interior Alaska, an area as large as Alabama. The four-phase system was developed by the Pacific Northwest Station of the Forest Service.

The system uses imagery from satellites, small-scale and large-scale aerial photography plots, and a newly developed field plot system. Besides data on timber volume, growth, and mortality, the surveyors will gather information on vegetation composition, density, production and biomass, wildlife habitat descriptions, fuels for fire management, and soils. The Soil Conservation Service and the Forest Service are producing a general vegetation and soils map for the Tanana Basin.

The 14-million acre western Tanana Basin was surveyed in 1982; resulting data will help the Forest Service meet the requirements of the Resource Planning Act for a national inventory of renewable natural resources.

Nitrogen Stress and Insect Attack in Lodgepole Pine Forests: Oregon State University scientists have shown that when a lodgepole pine tree is properly freed from competition, its crown becomes more efficient photosynthetically. This process allows the tree to rapidly reach its growth potential. At the same time, increased vigor causes the tree to become resistant to attack by the mountain pine beetle. An important product of the new information is development of an easily applied method of assessing tree vigor by measuring tree ring cores to quantify vigor as wood production per unit of leaf area. This research represents a significant breakthrough in controlling mountain pine beetle damage to lodgepole pine in the western United States. Findings have led to the development of an easily used stand improvement model for lodgepole pine. Short courses have been offered to more than 100 professional foresters to rapidly extend the new knowledge. The information is now being applied to help curb the current massive beetle outbreak in southcentral Oregon forests.

Nucleopolyhedrosis Virus (NPV) Registered with EPA: A naturally occurring virus disease of the European pine sawfly (*Neodiprion sertifer*) was registered by the Environmental Protection Agency in 1983 for use by the Forest Service. The disease is caused by a nucleopolyhedrosis virus (NPV) and the registered product has been given the name "Neochek-S."

This registration results from several years' research at the Forest Service's Center for Biological Control of Northeastern Forest Insect and Disease Pests at Hamden, Connecticut, in cooperation with several universities and Forest Service pest management specialists. The virus, environmentally safe, is effective at low dosages and inexpensive to produce and can spread through the sawfly population after application.

A Breakthrough on Transformation of Nitrogen and Sulfur in Soils: More effective, environmentally acceptable use of fertilizers is the result of Iowa Agriculture and Home Economics Experiment Station basic research on nitrogen and sulfur transformation in soils and their effects on air and water pollution. Among many research accomplishments were: (1) discovery of a bacterial pathway by which nitrous oxide is produced in soil and emitted into the atmosphere; and (2) a way to inhibit production of nitrous oxide. These accomplishments earned the Alexander von Humboldt Award for the research leader, soil biochemist J. M. Bremner, whose work was recognized as "the most significant contribution to American agriculture during the past five years."

4-H/Youth Natural Resource Projects: More than 846,000 young people across America participated in Extension 4-H natural resource programs and related activities with special emphases in the areas of forestry (131,700 participants) and wildlife and fisheries (244,000 participants). Extension Service membership on the National Wildlife Advisory Board provides for interagency liaison on fish and wildlife policy. The Extension Service also cooperated with the Forest Service in developing a new educational unit, "Economically Important Forest Insects and Diseases," for use in 4-H forestry projects nationwide.

Other 4-H forestry projects include a two-county special project in West Virginia on forestry careers involving 80,000 youth, including 2,000 4-H'ers, and a gypsy moth control program in New Jersey. Youth in that state learned about the gypsy moth life cycle and its effect on environment, and they conducted a citizen-awareness campaign for nearby communities.

Production and Protection

Agricultural productivity, which grew at an annual rate of 2.1 percent between 1939 and 1965, now increases at 1.7 percent a year. Crop and animal research and education programs increase

production efficiency and reduce losses to provide adequate quantities of high quality food, feed, and fiber.

Much research concentrates on understanding what plant and animal growth increases can be altered to increase the efficiency of food and fiber production.

Molecular Basis for Genetic Resistance of Disease in Cattle: Texas scientists are studying basic mechanisms occurring in genetic resistance to disease in cattle. They and others have found that this hereditary resistance involves two fundamental mechanisms. One mechanism is centered in receptors for cellular attachment and penetration by disease microorganisms. The other involves interferons: a family of protective proteins produced by cells reacting to disease agents. The Texas scientists have identified in cattle two classes of genes, one of which regulates cell receptor protection against viral infection. The identification of structural genes responsible for these two important resistance factors will make it possible to screen cattle for genetic resistance and to selectively breed resistant animals.

New Shipping Fever Vaccine: The product of more than 6 years of research by Ohio scientists was made available to the cattle industry in a new vaccine to prevent shipping fever, which costs the Nation's beef industry at least \$20 per head annually. This disease has been the animal health problem of greatest concern to beef cattle producers. The new vaccine involves a novel approach in which the causative bacterium is injected between the layers of the skin. It has been tested in an estimated 10,000 animals with no adverse effects.

U.S. and Spanish Cooperation: Research cooperation with Spain on African Swine Fever (ASF) through the 1976 U.S.-Spain Treaty of Friendship and Cooperation has been outstanding. Exotic to the United States, this virulent disease threatens our domestic hog industry while it persists in Haiti and the Dominican Republic. If an outbreak occurs in North America, the information and techniques gained from these joint studies will be invaluable in controlling the disease and minimizing losses.

American and Spanish scientists have (1) identified different clinical forms of the disease; (2) developed diagnostic techniques, including the Enzyme-linked Immunosorbent Assay (ELISA); (3) identified ASF viral proteins; and (4) noted immunological responses in swine.

Frozen Insect Embryos Return to Life: Agricultural Research Service researchers have frozen and brought back to life embryos of houseflies. Genes carrying beneficial characteristics can be retained in the frozen embryos, which opens the way to preserving rare genetic strains of insects, including those that could be used for biological control of insect pests. The successful freeze-thaw technique could help reverse losses of insect strains that are mass reared for release in fighting pests in the fields.

A New and Sensitive Method for Vitamin D Analysis: A highly sensitive, analytical technique can measure accurately level of vitamin D in milk, blood, and tissues of animals and humans. Concentrations of vitamin D in blood and tissues previously had to be estimated by inoculating live animals. Use of this new laboratory technique, developed by Agricultural Research Service scientists, opens new research avenues to understanding the role of vitamin D in metabolic diseases of the kidney, bone, and intestine of animals and humans.

Integrated Livestock Production Systems: In response to a mandate from the livestock industry, Extension programs nationwide are integrating component research results into systems which increase overall productivity. Programs that support this approach include the Integrated Reproduction Management, Residue Avoidance, and Grazing Lands and People. Current financial conditions require that producers know which of these multifunctional components can be economically implemented and in what combination. Unless a systematic approach is followed, adoption of a particular component may lead to economic losses rather than gains. The PEGRAM program in Idaho demonstrates how the systems approach can lead to net benefits for producers. After initiation on three cooperating ranches, the Idaho Cattlemen's Association worked with the Extension Service to expand the program with estimated net gains of \$3 million accrued to 20 additional participating ranches.

Computer System Will Track Down Plant Germplasm: A computer information network for the National Plant Germplasm System started operating in July 1983. Over 400,000 germplasm samples are stored in the system, which is coordinated by Federal and State agencies. Computerizing the system's storehouse of germplasm will give researchers quick access to genetic material that can be used in breeding crops to withstand pests, diseases, and drought. That wider genetic base will make crops less vulnerable to such threats in the future.

Crop Production Models: Recent technological advances in computers provide agricultural managers ready access to immense amounts of information for decisionmaking, producing an entirely new management tool. Montana's decision theory model is based on probability which exploits information that becomes available over time for wild oat control. Information such as wild oat seed in the soil, wheat price, soil moisture and cropping history provides decision alternatives on whether to apply herbicides, put land in summer fallow, or plant spring wheat. A modest saving of \$1 per acre amounts to about \$4million statewide. Mississippi is the lead state in developing regional simulation models for cotton, wheat and soybeans.

These models provide the basis for better understanding and predicting growth and will contribute greatly to the development of software useful in management decisions. Florida has developed a crop management model for optimizing soybean management practices. Crop, insect pests, and economic models are being implemented to allow producers to interactively evaluate the economic benefits and risks of management decisions within a growing season.

Integrated Pest Management: The Extension Service Integrated Pest Management program is a major source of information for the National Pest Survey conducted by the Animal and Plant Health Inspection Service (APHIS). Reports generated by Extension IPM scouts across the country are coded for computer input and transmitted by phone to the APHIS computer at Fort Collins, Colorado. In cooperation with the College of Agriculture, Michigan State University, the reports are processed so that pest specialists in a variety of disciplines and organizations (public and private) can utilize the information on pest occurrence and abundance. This cooperation among Extension Service, APHIS, State Cooperative Extension Services, State Departments of Agriculture, and private Integrated Pest Management (IPM) organizations provides a useful decisionmaking tool for the pest management operations nationwide.

Pest Management: An economic survey of pesticide use and pest management practices on major field crops by the Economic Research Service showed that the use of insecticides dropped dramatically from 131 million pounds in 1976 to 71 million pounds in 1982. This decline is

attributed to a reduction in pounds of insecticides applied to cotton as a result of the newly registered synthetic pyrethroids and more effective targeting of insecticides. Herbicide use continued to increase, much of this attributed to more acres in conservation tillage.

Processing, Marketing, and Distribution

Research, extension and teaching programs are being conducted to increase the information and knowledge base needed to maximize the efficiency of handling agricultural and forest products during processing, marketing, and distribution.

These activities focus on the portion of the agricultural system between harvest of food and fiber products and their ultimate use by the consumer. Programs include food protection during marketing and distribution, food quality and safety, and technology and safety of nonfood agricultural products.

Farm Financial Management: Extension programs in farm financial management assist producers in preparing and analyzing cash flow and other financial statements, developing improved farm organizational plans and making effective marketing decisions. Farmers receive assistance in coping with difficult financial problems through intensive Extension workshops and use of computerized financial management tools. Specific examples are the "Troubleshooting the Farm Business" program in Missouri; the more than 450 Ohio financial management program events attended by more than 28,000 farmers and agribusiness representatives; and a hotline service in Minnesota which combines quick access with followup assistance for farmers with financial problems. The "Farm Financial Management" handbook prepared in South Carolina is typical of similar efforts in nearly all states. Fact sheets have been developed including those on "Farm Financial Management," "Producer Grain Marketing," and "Producer Marketing Alternatives for Payment-In-Kind (PIK) Commodities."

Direct and Electronic Marketing: Extension Service continues to provide educational assistance to farmers in marketing, including direct and electronic marketing—especially small farmers. Direct marketing projects, developed through the funding of the Farmer-to-Consumer Direct Marketing Act of 1977, are continuing and, in some states, expanding. Major emphasis is on pick-your-own and roadside marketing. Such expansion includes programs in direct marketing of livestock products. Electronic marketing has a major impact on prices paid to farmers by increasing competition and improving marketing efficiency as buyers and sellers negotiate via computer terminals. Extension Service analyzed and summarized results of several state electronic market experiments and evaluated proposals for additional experiments funded by Agricultural Marketing Service. An educational program contracted with Virginia Polytechnic Institute and State University included four regional workshops for the agricultural industry, proceedings, general brochure, and a slide-tape set all developed for additional educational efforts.

Federal Crop Insurance: Using Federal Crop Insurance Corporation (FCIC) funds, Extension Service developed microcomputer software programs in cooperation with Texas A&M to assist farmers with their decisions on crop insurance. Extension and FCIC held four regional workshops to train Extension specialists in use of these computer programs. The workshops enabled state specialists to train county staff to assist farmers in making decisions on crop insurance needs for 1983. In addition, Extension conducted an expanded educational program to assist farmers in understanding the use of crop insurance as a risk management tool.

Increased Flexibility in Processing and Use of Natural Fibers: Traditionally, the cleaning and processing of wool and cotton fibers has required wholly separate technologies. By modifying a cotton carding cleaner, scientists at the Southern Regional Research Center have developed a technique which both removes undesired matter from scoured wool and shortens the wool fibers. As a result, cotton and wool can be processed simultaneously on a single system.

Bioregulation of Specific Gene Expression in Barley: Knowledge of gene structure and bioregulation of its activity is the key for introducing the concept of "hormonal balance" as an important trait in crop production and marketing strategy. USDA-ARS seed scientists at Beltsville, Maryland have demonstrated that the plant hormone, gibberellic acid, controls the de novo synthesis of alpha-amylase messenger RNA, the first step in producing this enzyme which is so important to malting quality of barley.

First Lignin-Degrading Enzyme Discovered: Lignin, the complex natural plastic that cements and stiffens wood fibers, comprises about 25 percent of wood. Researchers at the Forest Service Forest Products Laboratory have discovered a lignin-degrading enzyme. This enzyme is secreted by a fungus, *Phanerochaeta chrysosporium*, one of the organisms causing white-rot decay in wood.

Discovery of this enzyme opens up possibilities for many applications of biotechnology in wood processing, such as pulping, bleaching pulps, converting lignin to useful chemicals, and cleaning up noxious lignin wastes from pulp and paper mills. The increased knowledge of the decay process, gained by this research, may also lead to biological methods for controlling wood decay.

More Stable Soybean Oil: Food processors now have available a natural soybean oil that contains less than 3 percent linolenic acid, based on work of Iowa State University food scientists and agronomists. Linolenic acid can cause oil to develop "off" flavors and its level in U.S. soybean oil generally ranges between 7 and 10 percent. U.S. oil processors use hydrogenation to prevent off-flavor development. In countries where hydrogenation is not used and cooking techniques differ from those in the United States, the problem of "off" flavor has impeded the expansion of soybean oil markets.

Improved Utilization of Alfalfa: Scientists at Colorado State University have developed a technique which improves the utilization of alfalfa, a major U.S. forage crop. The carbohydrate portion of the plant can produce ethanol for fuel and the protein portion is concentrated to provide high-value animal feed. Approximately 4 billion gallons of ethanol could be produced from the current U.S. alfalfa crop, which could add \$6 billion annually in net agricultural income. About 10 gallons of alcohol could be produced for every gallon of fuel used to grow, harvest, transport and process the alfalfa to protein and ethanol.

Commercially Blended Beef-Vegetable Proteins Are Cost Effective: A Southern University investigator found differences in response to cost, cooking loss, cooked yield, and organoleptic characteristics between two blends of commercially extended ground beef/vegetable proteins (Tvp-II and Soya flour). Both retained nutrients similarly.

Commercial blends reduce the cost of all-beef products from 30 to 60 cents per pound. Protein content in cooked products varied in terms of type of extenders and fabrication. Loaves prepared

from soya flour were consistently rated higher by taste panels. Decision regarding the consumer choice of a specific commercially blended beef-vegetable blend should be based on: examination of labeling information relative to salt and other seasoning; recipe adjustment for type of fabrication; and cost in relation to yield.

Residue Avoidance Program: Extension Service and the Food Safety and Inspection Service (FSIS) launched a continuing cooperative effort to help livestock and poultry producers avoid violative drug and chemical residues in their slaughtered animals, educating farmers on proper animal drug use. Thirty-one state Extension services are involved in 37 projects, which include publications, residue hotlines, animal medication surveys of pesticide practices, exhibits, and slide sets.

People and Communities

The programs in People and Communities contribute significantly to the efficient functioning of the food and agricultural sector of the American economy. Activities involve assisting rural communities to solve local problems; fostering human resources development; assisting youth in acquiring knowledge, developing life skills and forming attitudes; and determining human nutritional requirements.

Family Financial Management: In an ongoing effort to add to family strengths, financial planning and management for families continues as a major program emphasis for Extension nationwide. In cooperation with Indiana, Extension Service developed and distributed nationally a "Curriculum Sourcebook for Financial Planning and Management for Families" which documents the content of what Cooperative Extension teaches in this area and identifies selected educational resources that support this content and lists public and private sector data bases. Extension Service also funded and distributed nationwide results from several special projects, including one in Mississippi where financial planning centers are established throughout the state.

Family Matters Program: The Family Matters Program of Cornell University seeks to create support systems by building on the strengths within families and by encouraging families to develop their capabilities. Program goals are to reduce isolation of families; recognize parents as experts about their children; reinforce and encourage parent-child relationships; share information about children, schools, services and work; encourage the exchange of resources between neighboring families; and facilitate concerted action by participants on behalf of their children.

Many parents report that their relationship with their children has been strengthened and improved as a result of their involvement in the program. They are spending more time in activities with their children; children are spending less time watching TV. Parents believe that the quality of their parenting has improved and that their social networks have been strengthened.

Better Use Of The Family Dollars Program: In response to the severe economic conditions, a Dubuque County, IA, Extension home economist prepared a proposal for funding a financial analysis and counseling program for the unemployed and underemployed families. The purpose of this program, Better Use of the Family Dollars, was to help 300 families analyze their financial situation and to assist the families in developing a cash flow plan to establish economic stability.

Of 309 families worked with during this program, 39 indicated at their first session an intent to file for bankruptcy. The program helped 36 of the families avoid filing for bankruptcy and 18

families avoid home mortgage foreclosure. Families became aware of community services available to them and were referred to these whenever possible. Community agencies also became aware of Extension Service and its educational programs.

Expanded Food and Nutrition Education Program (EFNEP): After a congressionally mandated needs assessment of the purposes, objectives, and effectiveness of this unique program for low-income families, Extension Service submitted two task force reports to the Congress with recommendations to improve the content, delivery, accountability, and evaluation of the EFNEP program. The agency has contracted with two states, New York and Michigan, for specific developmental work related to EFNEP reporting and curriculum. Plans call for implementation of task force recommendations throughout the Cooperative Extension system in early 1984.

Ten EFNEP Food Stamp projects funded with \$1 million from Extension Service and \$1 million from the Food and Nutrition Service were completed in 1983. The state projects are (1) testing alternative teaching methods for reaching more families with nutrition information and (2) evaluating these methods. Extension conducted orientation training for participating states. The agency also conducted a national EFNEP orientation workshop for the new recipients of program dollars—American Samoa, Micronesia, Guam, and the Virgin Islands.

Local Government: In conducting local government programs, Extension provides both technical information and assistance that result in identifying community needs, such as crime prevention; making public decisions; and implementing programs. Through a new computer information service called LOGIN (Local Government Information Network), Extension Service provides states access to an information data base on a wide range of needs and problems, including issues in local government, economic development, and community services and facilities. The data base provides case-study analyses based on local community experiences and innovations from across the country.

Extension Service also provides leadership for the Federal Laboratory Consortium (FLC), a coalition of 233 Federal labs and agencies that conduct high-technology research in domestic areas, including transportation, energy, housing, public works, and business productivity. The Technology Innovation Act of 1980 mandates that FLC provide technological knowledge and technical assistance to local and state governments and the business community.

Food Economics: While traditionally providing food economics programming, Extension Service has increased these efforts to meet the needs of the unemployed and financially restricted families. Extension programs across the country range from best food buys information; to point-of-purchase consultations; to meal planning; to budgeting help; to preparation suggestions; to methods of preservation; to complete menus for utilizing food stamps or very restricted resources to their maximum.

The nationwide Extension Master Shopper program provides volunteers with extended training in order to reach more people with food economic information at supermarkets, farmers' markets, and surplus food distribution centers. Extension Service has also prepared special materials to be given with the food at surplus distribution centers on how to best use, prepare and store these products for optimum nutrition and appeal. Best food buys information, no longer available from the Agricultural Marketing Service, is now available nationally on the electronic mail network from Wisconsin. Information on the current and projected food supply and price trends is used by state specialists and county agents in nutrition educational programs for families.

Availability of Vitamin B6: Researchers at Oregon State University studying biological availability have developed a laboratory method to determine the proportion of vitamin B6 in a food which is not available to humans when that food is eaten. Until now, the value of B6 as determined by microbiological assay could only be compared to the available amount by doing costly in vivo studies with human subjects. The new assay has led to identification of glycosylated forms as being the bound form of the vitamin. A high correlation was found between values for the amounts of nonavailable B6 in vegetables, grains and legumes, and meat as determined in human studies and in the new enzymatic-based assay.

This new assay technique will provide more reliable information on vitamin B6 values to dietitians and others for use in meal planning and in evaluating the adequacy of nutrient intakes.

Sodium and Hypertension Studied: A Cornell University scientist has been investigating the relationship of sodium intake to hypertension, with emphasis on influences of sodium intake of infants. Sodium intake beyond recommended levels does not appear to be immediately detrimental to healthy infants under normal circumstances, but a long-range effect of predisposing them to hypertension has not been ruled out. A survey of 155 mothers of infants up to 1 year old has identified variables in the level of sodium fed to infants such as feeding solid foods at an earlier age, salting infant foods, and giving salty snacks. The results indicate that mothers at high risk for hypertension tend to feed their infants relatively higher amounts of sodium than do lower risk mothers.

Regulation of Iron-Storage Protein With Aging: The iron-storage protein ferritin is important in regulating iron utilization in cells. As adults get older, they accumulate more iron in their bodies. As part of a study on how the amount of this storage protein is regulated in relation to aging, Agricultural Research Service scientists have cloned the ferritin messenger RNA of the rat and determined its sequence and the corresponding sequence of the ferritin protein. They can identify the mechanism controlling expression of the ferritin gene in relation to iron load and the aging process.

National Rural Development Symposium: Working with seven USDA agencies and the Rural Governments Coalition, Extension Service developed and supervised the organization of the National Rural Development Symposium. This is a first effort in the national rural development policy process mandated by the 1980 National Rural Development Policy Act. The Coalition consists of the national associations of towns and townships, counties, development organizations, and regional councils, in cooperation with the National Governors Association. The project offers USDA agencies an opportunity to interact with members of the Coalition on substantive issues facing rural governments.

The new Symposium identified program training and issue management skills by local officials as a major need. To meet this need the USDA Rural Development Committee funded a project for four multistate conferences and four national policy forums with funding from 16 USDA agencies to a coalition of local government groups. Extension Service collected the funds, executed cooperative agreements with the four principal members of the Department of Transportation and the Department of Housing and Urban Development, in the project.

Magazine for High School Science Teachers: With initial support from the Office of Higher Education Programs, the Council for Agricultural Science and Technology garnered additional

support from private foundations, businesses, agriculture cooperatives, and agribusiness associations to enable it to initiate publication and distribution of a quarterly magazine to 17,000 high school science teachers. Entitled "Science of Food and Agriculture," the magazine is intended to help advance public understanding of food and agricultural science and technology and, thus, encourage more students to pursue educational specialization that will prepare them for careers in the food and agricultural sciences.

Career Focused Youth: The Minnesota Youth Poll, a series of studies on youth carried out by the Center for Youth Development and Research, was focused on friendship and youth organizations during the past year. Findings showed that older teenagers considered work a priority rather than the joining of organizations. This has resulted in a new direction in the 4-H program in Minnesota which now has a career-job focus. A new specialist position in this area has been created for the purpose of attracting older teenagers into 4-H and help maintain the junior high population in 4-H.

4-H Citizenship: The Extension Service provides leadership to a national teen citizenship program involving more than 10,000 4-H'ers (aged 14-18 years) each spring and summer. Using the Nation's Capital as a classroom, youth from across the country discuss problems and possible solutions with Senators, Representatives, and officials of public and private organizations during a week-long course. USDA officials brief each group on agricultural issues and legislation. Each participant returns home with a plan of action for implementation in his or her community. This program is an excellent example of public and private sector cooperation with support from the National 4-H Council.

Agricultural Policy

Activities related to this program area are concerned with agricultural and food policy in general; demand, supply, and price analysis and forecasting; and development of domestic and foreign materials.

Sources of Recent Declines in U.S. Farm Exports: Economic Research Service researchers analyzed changes in equilibrium prices and traded quantities of wheat, feedgrains, and soybeans associated with eight factors having a major impact on recent U.S. farm trade. No single factor was dominant in explaining trade changes across all commodities. Income growth, population growth, and declining freight rates all tend to increase U.S. farm exports. Only two factors, foreign indebtedness and exchange rates, were found to reduce U.S. farm exports.

Effects of other factors on U.S. exports (USSR animal feeding decisions, foreign crop production, and European Community policy) varied by commodity. Generally, such factors had a positive impact on U.S. soybeans and soybean meal exports but a negative impact on wheat and feedgrain exports. Over the 2 years studied, the stronger dollar was estimated to have cost the United States \$6.0 billion in farm export sales.

African Food Emergency: An Economic Research Service analysis of African food availability described emergency conditions affecting 23 countries across the entire continent. Drought, the most severe in a century in southern Africa, reduced production and significantly increased commercial food imports and food aid needs. Some 9 million people (7 million in southern Africa) faced serious hardship and possible starvation. The United States sent an additional \$25 million for emergency food relief for southern Africa.

U.S. Agricultural Sector Assessment: Economic Research Service researchers described U.S. agricultural capacity, resource use, and productivity to identify sources and magnitudes of productivity advances. Analyses of demand and nonfarm competition for inputs indicated that the supply of and demand for U.S. agricultural products will become more unstable—with periodic increases in food prices and periodic decreases in farm incomes equally likely. Potential implications are that instability primarily affects the distribution of income and wealth between the farm sector and the nonfarm sector—not the total supplies of farm products.

National Curricula Assessment: USDA's Agricultural Research Service—Higher Education Programs, working cooperatively with representatives of Colleges of Agriculture and Natural Resources and with business and industry leaders, conducted a national assessment of undergraduate curricula in agriculture and natural resources to identify desirable changes. The assessment phase of the project was completed with 12 high priority areas identified as inadequately represented in today's agricultural curricula.

The three highest priority long-term areas are: (1) Introduction to Agricultural Systems Analysis, (2) Problem Solving in Agriculture and Natural Resources, and (3) Ethical and Public Policy Aspects of Domestic and International Agricultural Systems.

The three highest priority short-term areas are: (1) Man and His Food—Biological and Consumer Aspects, (2) Systems of Integrated Pest Management for Crop Production, and (3) Leadership.

National Higher Education Agenda: The NASULGC Resident Instruction Committee on Organization and Policy and the American Association of State Colleges of Agriculture and Renewable Resources, working jointly with industry and USDA's Agricultural Research Service—Higher Education Programs, published a national higher education agenda to develop scientific, professional, and managerial expertise for a strategic U.S. agriculture—Human Capital Shortages: A Threat to American Agriculture.³ This publication was the result of efforts by deans and directors of resident instruction in both land-grant and non-land-grant colleges of agriculture across the Nation. Considerable effort was involved in working with industry and others in the food and agricultural sciences system to prepare and publish this document. The process served as an impetus for convening national and regional forums for representatives of agribusiness and industry, Government, and higher education to address the specific actions which must be initiated by public and private sectors to assure the Nation of an adequate food and agricultural scientific expertise base.

Recommendations for development of agricultural expertise included: (1) directing increased resources to attracting the brightest and best students for undergraduate and graduate preparation in the food and agricultural sciences; (2) setting National and state priorities to direct additional resources toward strengthening the higher education programs in colleges of agriculture; and (3) developing and maintaining a national information system for assessing and forecasting agriculture and natural resource human capital requirements.

The document, distributed nationwide, received notable attention by the media. It has been an important vehicle for alerting policy and program decisionmakers and the general public on the serious problems and specific actions needed.

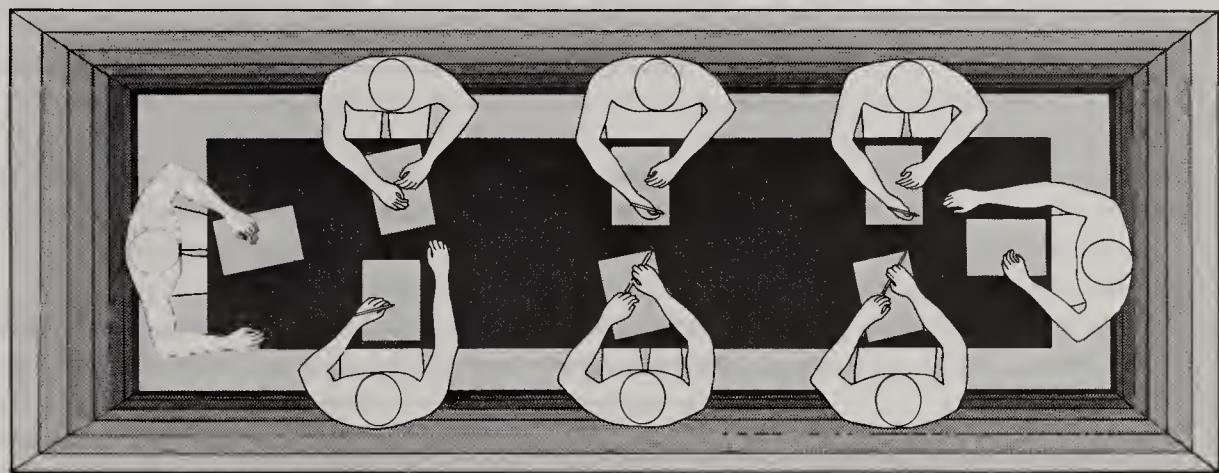
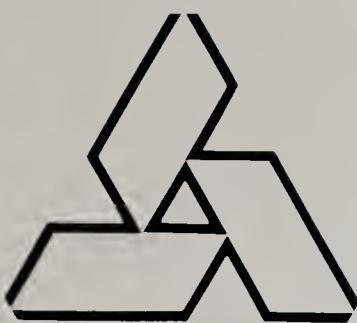
General Administration and Program Support	General administration and program support includes technical information systems, administrative and financial support, facilities support, and expertise development.
	Electronic Technology: Electronic technology applications to support and improve program management, interactive communications, and program delivery to clientele continue to accelerate as Extension moves forward in the electronic age. A nationwide Extension electronic mail network now serves all 50 states, the District of Columbia, and Guam. In Missouri and Colorado, district and some county offices are also on the system. Data bases such as AGSNEWS and EXTNEWS serve as electronic bulletin boards to provide news of general interest for all users. Two data bases—the Computer Outlook Information Network (COIN) and the National Accomplishments Reporting System (NARS)—operate nationally over the electronic mail system. The system is now under evaluation to determine effectiveness and efficiency and to make future recommendations for optimum use.
	Statewide computer systems such as FACTS (Indiana), EXTEND (Wisconsin), and ESTEL (Maryland) expedite communications and program delivery throughout the Extension system. As agriculture knowledge suppliers, Extension is translating research into software for family farms, agribusinesses, marketing institutions, families and communities.
	A joint ECOP (Extension Committee on Organization and Policy) and Extension Service Committee on Electronic Technology was formed recently to assess the current status of the technology, plan for future application, investigate interfacing, and identify policy issues.
	National Food and Agricultural Education Information System (FAEIS): During the past year, the USDA, Agricultural Research Service—Higher Education Programs office worked extensively with university and industry cooperators to initiate development of a national computerized food and agricultural education information system (FAEIS). Data for FAEIS include a broad spectrum of attributes of the U.S. food and agricultural higher education system (such as student enrollments, degrees conferred, graduate student support, cost of education, college and university faculty, and occupational employment demand for graduates). When operative, FAEIS will have interactive query capabilities, and will generate a series of standardized annual reports.
	Additionally, USDA published the third in a series of reports addressing the Nation's supply of and demand for food and agricultural graduates titled "Graduates of Higher Education in the Food and Agricultural Sciences: Volume III—Sex, Race and Ethnicity Characteristics of Students and Graduates and of Food and Agricultural Professionals." The data in Volume III will become a part of FAEIS.
	Faculty Development and Student Recruitment: During the past year, several additional projects were initiated at the national level in an effort to strengthen the food and agricultural sciences higher education system. One such project entails focusing on identification and prioritization of faculty development objectives, development of innovative models for faculty development, and establishment of joint university and/or industry-education networks to encourage and support enhanced faculty development opportunities.

Another project involves addressing development of college and university marketing strategies and a model action-oriented recruitment program to increase the number of students enrolling in agriculture, particularly high school graduates of high academic ability and minority students.

Regional Document Delivery System Expands: A new region in the USDA, National Agricultural Library (NAL) Regional Document Delivery System began operation in July 1983. The region covers Michigan, Ohio, Pennsylvania, and New York. Seven regional centers linking 35 land-grant university libraries with NAL are now operating nationwide. Primary users of the system continue to be personnel of the Agricultural Research Service and the Forest Service, although there is increasing usage from employees of the Soil Conservation Service.

Documents of 36 States Now on Film: Purdue, Missouri, and Iowa State Universities participated in 1983 efforts for filming of their agricultural publications in cooperation with NAL. Since NAL launched this cooperative program in 1974, the documents of 36 states totaling over 2 million pages have been microfilmed for archival, preservation, and storage purposes. Bulletins, circulars, reports and other land-grant documents are filmed upon recommendation of a user's and librarian's advisory group.

Accomplishments of the Joint Council



Needs Assessment Drafts Prepared: The Joint Council devoted much of its time to the development of the Needs Assessment Report for the Secretary of Agriculture. An overview of the needs for food, fiber, and forest products projected to the year 2000 and beyond has been developed; and long-term problems the United States is likely to encounter have been identified. The impact that research, higher education, and extension can be expected to have in solving these problems also has been defined. Program categories are: soil, water, and air; forest, range, and wildlife; crop production and protection; animal production and protection; processing, marketing, and distribution; human nutrition; consumer programs; youth, family, and community development; and agricultural policy.

FY 1985 Priorities for Research, Extension and Higher Education Published: This year, the Joint Council and its committees and partners in food and agricultural sciences spent considerable time and effort in identifying and ranking priorities for research, extension, and higher education. The priority-setting process took into consideration state and regional priorities. Initially, 24 national priorities were developed. In May, the Joint Council met and selected eight national priorities for FY 1985. The eight priorities are:

1. Basic Biotechnology Research
2. Scientific Expertise Development
3. Communications Technology
4. Analysis of Price and Income Policies with Emphasis on Foreign Trade
5. Sustaining Soil Productivity
6. Human Nutrition, Including Food Safety and Quality
7. Water Management
8. Forest, Range and Pastureland Productivity Enhancement Including Multiple Use

These priorities provide the main emphases for development of the FY 1985 budget for Science and Education in USDA.

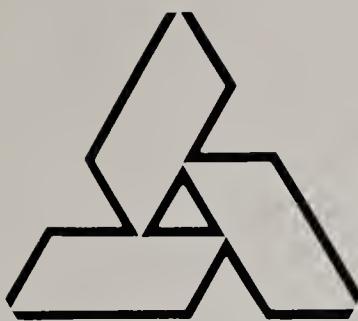
Related Studies/Activities in the Food and Agriculture System Examined: During 1983, the Council surveyed various ongoing studies and activities in the food and agriculture system; identified relationships among those studies and the mandated reports; and learned how the information from these studies and reports will be used by the food and agriculture system.

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- A study on priority-setting processes in food and agricultural research and extension programs was designed to assist USDA in delineating current formal and informal priority setting processes.
 - A study entitled "The Transfer of Agricultural, Food and Related Technologies" seeks to identify the roles of the various public sector and private sector organizations in generating and transferring of agricultural and food related technologies.
 - "Extension in the 80's, A Perspective for the Future of the Cooperative Extension Service"⁴ was considered by the Council. The study reviewed and restated the roles and responsibilities of each of the partners in Cooperative Extension, and produced a document for use as a guide for the future mission, scope, priorities, and policies of the Cooperative Extension Service.
 - The ARS Program Plan⁵ which provides a master framework for program direction, coordination, and management was presented to, and discussed with, the Council. The Plan was developed to ensure that the agency has a true national program directed to the highest priority needs appropriate for ARS and within limits of available resources.
 - Brief summaries of three additional studies were also provided to the Council. The three studies were "Identification and Assessment of Emerging Agricultural Technologies," "Assessing the Needs and Opportunities to Strengthen the Base of Research Underlying Extension Programs," and "Our Natural Resources: Basic Research Needs in Forestry and Renewable Natural Resources."⁶ Relationships among the studies were put in a conceptual framework and their linkages to the overall planning/priority-setting/implementation process were discussed.

Interactions with the Users Advisory Board: The National Agricultural Research and Extension Users Advisory Board and the Joint Council in a combined session in August discussed the role of the Secretary of Agriculture in planning and coordinating federally funded agricultural research and extension programs. The major issues considered were multi-source funding of research; and planning, coordinating, and funding programs involving multiple federal agencies with emphasis on agencies outside USDA. Recommendations were developed by the two groups on how to improve coordination of federally funded food and agricultural programs.

Additional Agenda Topics: During 1983 the Joint Council devoted attention to several additional topics including: (1) issues and alternate actions concerning the development of human expertise, (2) a focus on the appropriate and most important parts of information flow and exchange, (3) the contributions of 1890 institutions and Tuskegee Institute and linkages with 1862 institutions, and (4) the contributions of non-land-grant institutions and linkages with land-grant institutions.

Accomplishments of the National Committees



National Extension Committee

The National Extension Committee developed and implemented an expanded process to identify and rank Extension priorities. Information was solicited from the Extension Committee on Organization and Policy (ECOP) Program Subcommittees, Extension representatives to Regional Councils, and Extension Service/USDA sources. This information was assimilated, ranked, and presented to the Joint Council. Other activities include: (1) adoption of a resolution requesting exemption of the Cooperative Extension Service from Executive Order 12372 which provides for additional state review of funding; (2) presentation and discussion of institutional roles and relationships; (3) review of progress on the national study assessing the research base supporting Extension programming, being conducted by West Virginia; and (4) development of a mission statement for the National Extension Committee, adopted from the Committee's Charter.

National Higher Education Committee

As the central unit representing the full spectrum of the food and agricultural sciences higher education community at the national level, the National Higher Education Committee continued to articulate the increasingly urgent needs for human expertise development. It took a leadership role to make expertise development a top priority in the Joint Council's report on "FY 1985 Priorities for Research, Extension, and Higher Education." The committee also assisted in starting a USDA-education-industry national curriculum assessment in agriculture and natural resources. The committee served as a mechanism for addressing priority issues at the national level by providing a forum for joint involvement of all of the partners in the food and agricultural higher education system—Agriculture, Veterinary Medicine, Forestry, and Home Economics—from both land-grant and non-land-grant colleges and universities.

National Agricultural Research Committee

The National Agricultural Research Committee developed national agricultural and forestry research initiatives for the FY 1985 budget and the Joint Council used these as it developed national research, extension, and teaching priorities.

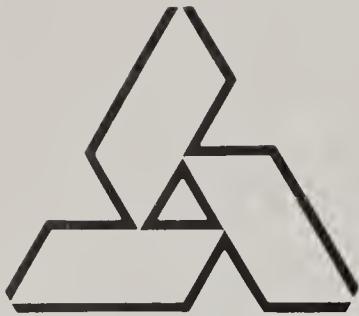
The Committee conducted the 7th biennial research projections, for 1983-88. Results of these projections will be used to prepare a document showing expected changes in areas of research emphasis for the USDA Land-Grant System under two assumptions: (1) no increase in funding, and (2) 20 percent increase in funding. These projections offer insight into research priorities and programs for the nineties.

A Task Group on Basic Research in Agriculture was organized. It will present recommendations in 1984 on basic research needed in agriculture and forestry.

The Current Research Information System (CRIS) has been revitalized including a clearer grouping of food science and human nutrition research programs and changes in the inventory of economics and other social sciences.

During 1983 the National Agricultural Research Committee approved its mission statement.

Accomplishments of the Regional Councils



Western Regional Council

All three of the Western Regional Council's (WRC) functional committees reported their projections for priorities for 1983-1988. As a result WRC accomplished its major goal for 1983: establish regional priorities across all three functional areas. Statements defining the top priority problems were also developed and the entire package was forwarded to the Joint Council. WRC's priorities were included in the Joint Council report of FY 1985 Priorities for Research, Extension, and Higher Education.

Improving communications was another major goal of WRC in 1983. A representative of the Users Advisory Board attended both WRC meetings in 1983. This gave the Council an opportunity to understand Board actions and recommendations better as well as provide feedback on WRC interests and activities. Similarly, the USDA Assistant Secretary, Co-Chair of the Joint Council, attended the fall meeting of WRC and discussed Joint Council goals and objectives with the members.

WRC's Western Agricultural Research Committee undertook a unique pilot project in 1983 by establishing a special task force to study water, the region's top priority problem, and to determine if one or more problem definition plans can be developed. The plan(s) should provide administrators of appropriate organizations and institutions with information that would not only allow them to direct resources into the highest priority problem areas but also to do so in a manner that reduces unnecessary duplication between institutions and capitalizes on their organization's expertise. Moreover, the process could be a model for use by all regions for all high-priority problem areas.

Northeast Regional Council

The Northeast Regional Council accepted the report of the Special Futuring Project Task Force and instructed the Task Force to develop procedures to accomplish the proposal. "Northeast Food, Agriculture and Forestry Futuring: 2002 - Issues and Opportunities" can be a substantive aid in planning and forming of policy on food, agriculture, and forestry by the leaders of public and private agencies and organizations through articulation of available choices in molding a desirable future.

Objectives of this Northeast Futuring effort are to facilitate timely, responsible, and intelligent decisions on the future. Also, it will serve as a catalyst to effect desirable change. Projections will portray such essential areas as: (a) general economic and social setting; (b) the food, agriculture, and forestry industries; and (c) the food, agriculture, and forest science and education system.

The Task Force, working through the Regional Council and the Functional Committees of Research, Extension and Teaching, developed the operational structure and the necessary budget. The project should get under way during 1984 and is to be completed within a year.

The Regional Council reviewed the role of its Extension Committee as an action committee and concluded the focus of the Committee should be on the needs of the northeastern states. The Futures Report will be linked with the Extension programs.

The Northeast Cooperative Extension Committee focused on considerations to use when formulating priorities and guidelines for future needs of the Northeast. The Committee believes that Cooperative Extension should not limit its scope to Extension and to the Land-Grant system,

but rather to all the factors that influence Extension's role to meet social, economic and business educational needs of all rural and agricultural populations.

The Northeast Regional Council identified research priorities for the region which were considered by the Joint Council in developing national priority recommendations.

North Central Regional Council

The North Central Regional Council participated in the review and ranking of program priorities for research, extension, and teaching for consideration by the Joint Council in developing national priorities for FY 1985.

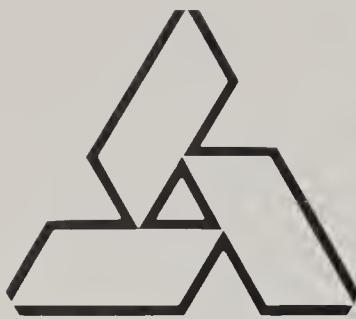
A major involvement of the NCR Council representatives has been the continued development of the North Central Computer Institute. It now has guidelines and protocol on software development and cataloging. Coordinated regional and state workshops and training programs were held during 1983.

Regional research coordination, planning, and prioritization involved examination of the ARS 6-year plan and of regional priorities for agriculture, home economics, forestry, and veterinary medicine. A major concern is the development of a strong formula funding program for areas identified for competitive grants as well as supporting competitive grant programs.

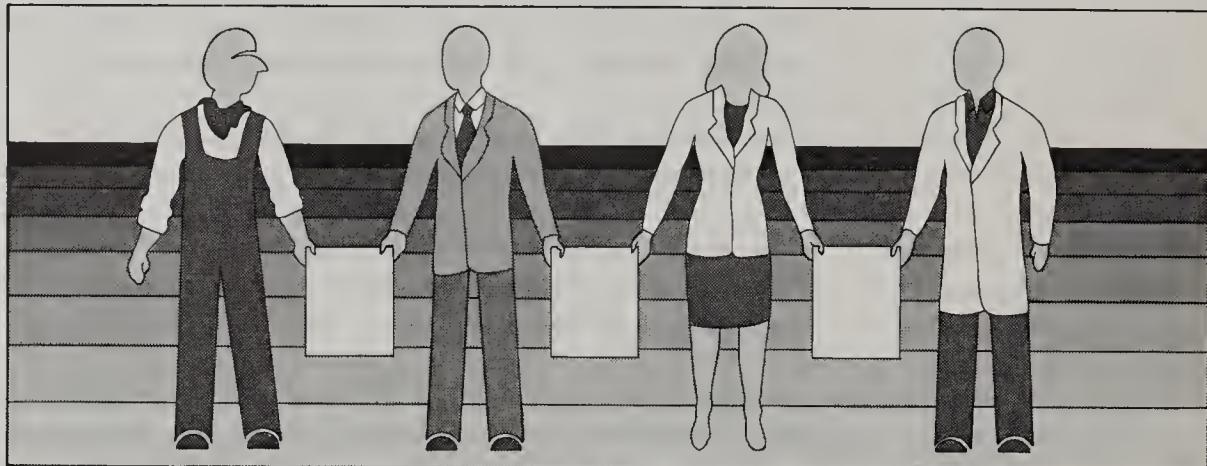
Extension regional planning has included coordination of over 20 workshop/training sessions, resource materials, and publications. Ten task force committees have been at work looking at the response to the national report on Extension in the 80's.

Resident instruction planning and coordination have involved participation in the national data base development and recommendations of program priorities to the National Teaching Committee. A major effort has been initiated on a curriculum survey and review regionally, contributing to a national review.

Overall, efforts are made to relate the planning and coordination of program priorities to the national committees of Joint Council as well as to the lay advisory groups with particular attention to the Council for Agricultural Research, Extension, and Teaching (CARET).



Evaluation and Planning Studies in the Food and Agricultural System



National Studies/Evaluations Numerous national studies and evaluations are being conducted and used throughout the food and agricultural system to improve the effectiveness of the teaching, research, and extension programs. Many of these involve Federal and State institutions in the development of reports and recommendations for the food and agricultural system.

National Extension Impact Studies: Part of the Extension Service's new accountability and evaluation system provides for the conduct of 6-10 national impact studies over a 4-year period. The Policy Council for the new system identified five topics, to date, to be addressed by such studies. Study designs for these five topics were developed by Extension Service staff and are being implemented.

- Identification of Roles and Input of Volunteers in Extension—Work by the study team began September 12 through a cooperative agreement with the University of Wisconsin. A national advisory panel was held in November. The first wave of data collection, a survey of CES staff with regard to the impact of volunteers on CES programs, began in December 1983.

- Integrated Pest Management (IPM)—Through a cooperative agreement with the Virginia Polytechnic Institute and State University (VPISU), work on the refinement and further specification of the study design began by the full study team on September 15. The IPM task force, following a briefing by VPISU and USDA-ES staff, reported on progress to the Extension Committee on Organization and Policy-Agriculture and Natural Resources Subcommittee during October 1983. Starting in November, the VPISU project leader has begun one-on-one meetings with representatives from states that will be conducting IPM case studies.

- Financial Planning and Management—a cooperative agreement to help carry out the study has been signed with the University of Missouri.

- In the two-phase, 30-month study, a national profile of Extension financial planning and management programs will be developed; and farmers and families in selected states will be surveyed for information on these programs.

- Renewable Natural Resources—a cooperative agreement, which is a joint venture between the Extension Service and the Cooperative State Research Service, has been signed with Colorado State University. The study will examine impacts of Extension programs in forest management, wood use, and range management.

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- Leadership Development—a study is being conducted primarily by the Extension Service staff with some assistance being provided to them in the first phase of the study—which will identify how the CES are providing leadership development opportunities through a cooperative agreement with Washington State University.

Priority Setting: Priority-setting processes in the food and agricultural research and extension programs are being evaluated through a planning study carried out for and by a panel of leading decisionmakers in the food and agricultural research and education system. The study is designed to focus on the processes of priority setting. The panel will answer questions on how priorities are set and on preferred ways of setting them. Plans will be developed to address the means of achieving the preferred ways of priority setting. The chief significance of this activity is that consensus planning for improved priority setting processes is done by acknowledged leaders among decisionmakers in the food and agricultural research and extension system.

Emerging Agricultural Technology: Through a group of studies, emerging technologies in agricultural production most likely to be adopted by the turn of the century are identified and described and their adoption profiles are estimated. Future economic, social, and environmental impacts of these technologies are being assessed. The chief significance of this work is that identification and impact assessment of emerging technologies in agricultural production permits the selection of technology development and transfer strategies best designed to optimize the processes and impacts of technological change.

The system for development and transfer of agricultural technologies is complex, varied, and changing rapidly. This makes it difficult for legislators, policymakers, and public program managers to adequately understand and assess the overall system and their relation to it. Legislative, policy, and program leaders are interested in improving the performance of agricultural research and extension programs. Such improvements can come from a better understanding of the current roles and capabilities of these agencies within the overall system.

Technology Transfer: A 3-year study, "The Transfer of Agricultural, Food and Related Technologies," funded by Science and Education, USDA, and conducted by the Institute for Policy Research and Evaluation, Pennsylvania State University, is addressing the need for a better understanding of the system for developing and transferring agricultural technologies. The overall objectives of this national study are: (1) describe the ways in which formal and informal interaction among a variety of organizations—public and private, Federal and state, research and extension—affects the transfer of agricultural technologies; and (2) identify critical issues and problems in the transfer of agricultural technologies, and suggest policy alternatives regarding governmental and university strategies and roles to improve the transfer of agricultural technologies. The study will be completed in June 1984.

Basic Research Needs Described for Forestry and Renewable Natural Resources: A report on basic research needs in the forest sciences was prepared at the request of two organizations with a longstanding commitment to the discovery of new knowledge in the sciences underlying forestry and related renewable natural resources: the Association of State College and University Forestry Research Organization (ASCUFRO) and the U.S. Department of Agriculture Forest Service (USDA-FS). Both organizations recognize that the scientific foundations for future applied research and development have failed to keep pace with the demand for forest resources. As a result, forest productivity and the productivity of other renewable natural resources confront the possibility of stasis, or decline, as demand becomes greater and more urgent.

Our Natural Resources: Basic Research Needs in Natural Resources stresses we must learn more about: how forests grow; how forests affect air and surface water quality; how forests and range plants can be protected against disease, fire, insects, overgrazing, and human carelessness; how wildlife and fish populations respond to changes in habitat and environmental quality; how the energy, fibers, and chemical substances accumulated in trees can be used with greatest material and energy efficiency; how the satisfactions of individuals and families are influenced by the timber products, forests, wildlife, and surface waters in their surroundings; and how forest products contribute to the economic well-being of landowners, craftspeople, investors, and the international balance of payments for the United States.

Report On Long-Range National Forestry Research Program Published: Forest technology—knowledge, methodology, and equipment—is the product of research, and constitutes the major longrun influence on forest productivity. The kinds of technology that eventually emerge from research depend on the research goals that are selected, and the mix of research programs to accomplish those goals. This report—1980-1990 National Program of Research for Forests and Associated Rangeland, General Technical Report WO-32⁷—describes the forestry research goals and program areas of the 60 forestry schools and universities and the U.S. Department of Agriculture (USDA).

Information presented in the report reflects the thinking of a broad segment of the forest science community about America's research needs for forests and associated rangelands. Needs are described for: multiresource inventory, appraisal, and evaluation; timber management; forest protection; harvesting, processing, and marketing of wood products; forest watershed, soils, and pollution; forest range and wildlife; and forest recreation and environmental values.

CES State Plans of Work FY's 1984-87: In response to increased need for identifying and documenting program impacts, the Federal and State partners within the Cooperative Extension System established a nationwide planning, reporting, and evaluation system which was implemented in FY 1984. This system is built around a 4-year planning cycle, a realistic time frame for Cooperative Extension workers to plan, develop, implement, and evaluate programs. It begins with an in-depth assessment of needs and comprehensive planning and involves collecting participation data, writing accomplishment reports, and conducting selected national and state impact studies. These components are coordinated at the Federal, State, and local levels and among all three partners. This longer range planning shifts from prior emphasis on staff time allocation and other input resources to measuring program results, impacts, and consequences. The 4-year planning cycle also allows for more in-depth involvement of local people in program planning, evaluation, and feedback than was previously possible.

Information provided by states and territories will be kept readily accessible in an expanded on-line data base called NARS (National Accomplishment Reporting System). NARS will include: keywords when searching the data base; 1-page narratives that will describe measurable program objectives planned and the subsequent accomplishments of each major program; statistical data on staff years, number of volunteers used in programs, and number of counties involved in statewide programs; and 1-page abstracts of national and state program impact studies. These latter assessments will focus on program results, providing substantial validated data on organizational achievements.

"Blue Ribbon Report": The Assessment of the National Agricultural Library—Final Report to the Secretary⁸—commonly referred to as the "Blue Ribbon Report"—was published by an Interagency Panel at the direction of Secretary Block.

The panel, chaired by Ray Kline, Deputy Administrator of the General Services Administration, included administrators from the Library of Congress, National Library of Medicine, the National Commission on Libraries and Information Science, the National Archives, the Federal Library Committee, and the International Development Cooperative Agency. The panel worked in close collaboration with USDA as well as with the land-grant universities.

The report, submitted to the Secretary on August 12, 1982, will serve as a blueprint for the future activities of the National Agricultural Library.

"Extension in the 80's": The Joint Committee on the Future of Cooperative Extension, composed of representatives from USDA, the National Association of State Universities and Land-Grant Colleges, State and local governments, users, and the private sector, presented its report on the future of Cooperative Extension to the Secretary of Agriculture and the head of NASULGC in February 1983. The Committee restated the roles and responsibilities of each of the legal partners in Cooperative Extension—Federal, State, and county governments. That document, as mentioned earlier, serves as a guide for the future mission, priorities, and policies of the Cooperative Extension Service, in the Department and throughout the Nation.

The report recommends:

Basic Mission: Disseminate and encourage the application of research-generated knowledge and leadership techniques to individuals, families, and communities.

Priorities: Establish priorities within six major program areas—agricultural system, natural and environmental resources, community and small business development, home economics/family living, 4-H youth education and development, and international concerns; with broad flexibility retained by State and county partners in the priority-setting process.

Research: Remain as the base for the system's major information and educational efforts.

Linkages: Strengthen linkages with other USDA agencies and other departments of government.

Volunteer Systems: Expand use of volunteers in all Extension programs (currently 1.5 million volunteers contribute to Extension Service programs under guidance of professional staff)

Private Sector: Recognize an increasing involvement by the private sector in Extension programming.

Methodology: Use new electronic methodology to supplement existing teaching methods in delivering education.

Evaluation: Allocate adequate resources for developing improved evaluation methods.

Human Capital Shortages: A Threat To American Agriculture, a report mentioned earlier, includes the higher education agenda for the development of scientific, professional, and managerial expertise for the future.

ARS Program Plan: The Agricultural Research Service (ARS) has developed and put into effect a program plan that provides a master framework for program direction, coordination, and management. Its purpose is to insure that the agency's program is focused primarily on national

issues and directed to the highest priority needs. Contributions to the goal are made through six research objectives: (1) soil and water conservation, (2) plant productivity, (3) animal productivity, (4) commodity conversion and delivery, (5) human nutrition, and (6) integration of agricultural systems.

Three components comprise the ARS Program Plan. The program strategy outlines the full array of science needs and opportunities appropriate to ARS for the long term (10-30 years) without the constraints of limited resources. The implementation strategy establishes a 6-year program plan which sets funding targets and priorities. This involves systematically evaluating science opportunities and comparing them with existing programs. Operational planning involves determining specific research projects and all related managerial and evaluative activities essential for putting the program plan into effect. The plan provides a means for ARS to communicate with its cooperators in program coordination.

ERS Program Plan: At the beginning of FY 1983, ERS distributed a report titled "The Economic Research Service in 1983."⁹ The report provides information on the ERS mission, organization, major activities in FY 1983, funding and employment. A similar document will be prepared for FY 1984; in addition, copies of more detailed FY 1984 workplans will be distributed to persons with a direct interest in economic research.

During FY 1983, ERS initiated a process for developing a long-term plan. In addition to a review of the ERS mission and functions, the plan will address the major objectives and planned accomplishments in the eighties and it will include information on the program and databases to be developed. The plan will summarize the principal policies and procedures ERS uses to carry out its program. The plan is to serve as a guide for developing annual workplans and budgets.

State Planning/Studies

Planning for agricultural research in the State agricultural experiment stations involves developing and maintaining a spectrum of scientific and agricultural expertise to meet research needs of the State's food and fiber system. Other requirements include a responsive organizational structure and enough human and material resources to meet continuing and changing needs.

Agricultural requirements of the State, articulated by those who practice agriculture, and endorsed by the State legislature as the principal investor, exert the most influence on the research profile of the State agricultural experiment station. Other forces include the parent university, Federal research funding agencies, and opportunities within scientific disciplines. These same forces also affect planning processes involving a state agricultural experiment station with other State stations and USDA research agencies.

Individual States have moved to more formalized planning. The plans include identifying the goals with action plans to provide cohesiveness of purpose and achievement. Evaluation is included to compare research alternatives for maximum payoff. How complex the planning process is, is usually correlated with the size and complexity of the state's agriculture. Following are some examples of state activities reported during 1983.

Oklahoma Agriculture 2000¹⁰: Oklahoma Agriculture 2000 is a study of how the Division of Agriculture at Oklahoma State University can best serve agriculture in the next two decades. Resources, constraints, and opportunities for the state's agriculture to the year 2000 were

analyzed. Oklahoma's economic future depends on the level and productivity of the State's human, natural, and capital resources. Economic activity rests on basic industry which brings in dollars from outside the State. Agriculture is the largest basic industry in the State whose output can be sustained in the foreseeable future. Thus, the longrun economic future of Oklahoma will be determined more by agriculture than by any other industry.

Several circumstances influenced the development of the report including: the number of farms and farm people will stabilize or even grow; the average age will stabilize or decline; the number of part-time operators, small farms, and large farms will increase while there will be fewer midsize family farms; diversification into production of enterprises other than cattle and wheat is necessary; and a need to cope with instabilities of markets, weather, and input costs.

Target 2000 Project for Texas Agriculture¹¹: Although agriculture (including forestry) in Texas may be considerably transformed by the Year 2000, it will remain highly significant. Changes will be influenced by (1) the State's growing population which will demand more agricultural products while competing for the resources needed to produce them, (2) economic cycles which will likely decrease the number of smaller farms and increase the number of large farms and part-time farmers, and (3) significant scientific discoveries and technological developments which will lead to new products and new processes. The Texas A&M University System reviewed and assessed needs, using outstanding leaders in several sectors in Texas.

These issues will require new research, development, and educational programs in the Texas A&M University System: (1) water and energy problems, (2) production efficiency, (3) revision of support and operational services to reduce production costs, and (4) changing demographic and economic conditions.

The Texas Agricultural Experiment Station developed statements of needs, objectives, and recommendations for each commodity, livestock species, and natural resource; and target statements describing the appropriate science and technology to address the research needs. The study concluded that new research should focus on water, energy production efficiency, and the development of new processes and products.

Program Planning in Colorado: Colorado State University is initiating a program planning approach and structure to improve the efficiency and effectiveness of the cooperative extension and agricultural research programs by assuring coordinated and balanced focus on highest priority, current and emerging problems and opportunities.

For each agricultural program area identified, a program planning panel of up to seven representatives of departments and other units directly involved in extension, service and/or research in the subject matter covered by that area will be established. A program planning committee, composed of the chairpersons of the program planning panels, will help plan, coordinate and expedite the work of the panels, and advise and consult with the executive director on program scope, priorities and related matters.

Special attention will be given to current or emerging problems and opportunities that may critically affect Colorado agriculture in the nineties and beyond, taking into account future problems and opportunities in the United States and Colorado agriculture.

Delaware Agriculture in the Eighties¹²: Important factors which affect Delaware's competitive position in agriculture were examined in a report which includes characteristics of American farming in the future which impact the direction of farming in the eighties. The report concluded that: (1) farmers and other agribusiness firms should become better financial and business managers, (2) the economic feasibility of greater diversification in Delaware's farm production should be determined, to achieve better allocation of resources; (3) new off-farm agribusiness enterprises should be developed that could complement, but not unduly compete with, present enterprises; (4) a Delaware agricultural export council should be organized to help farmers take advantage of international markets; (5) each Delaware commodity organization and general farm organization should have a special evaluation committee to review the organization's objectives and effectiveness in providing direction; (6) Delaware agriculture should have a unified policy and voice to the maximum extent possible; and (7) there should be renewed emphasis on leadership development within Delaware agricultural organizations, so that agriculture's concerns can be best addressed and represented.

These conclusions were discussed with a group of 100 agricultural leaders from Delaware to learn what they believe is required to sustain a viable agriculture in the state.

Florida Agriculture in the Eighties¹³: The early eighties signal a different kind of decade—characterized on the bright side by rapid, high-technology developments including bio-engineering and new computers. These developments offer great promise of a new generation of technology to meet the needs of the food and agricultural industry in the decade ahead. But also, the eighties are a time of deep economic concern on a global scale. Such continual change affirms the need for analysis of current conditions as well as planning for the challenges and opportunities ahead. The University of Florida Institute of Food and Agricultural Sciences conducted an in-depth planning effort.

The purposes were to: (1) identify some of the major considerations in the general setting, (2) identify and discuss the central tendency or general direction of change in each of the considerations over the next several years, and (3) explore the implications of these changes for Florida's agriculture.

Florida Agriculture in the Eighties focuses on key factors that affect yield potential of commodities. Production potential is assessed for 52 commodities with alternative technology for low, medium, and high levels of input.

Appendices

Appendix 1

Joint Council on Food and Agricultural Sciences Membership List

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Appendix 2**Joint Council on Food and Agricultural Sciences
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Appendix 3

References

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